

Design and Fabrication of Automatic Centre Stand Operated by Power Screw

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Abstract-*The paper deals with continuous improvement in design which leads to development of current structural design to reduce human efforts. The present design of centre stand or main stand of two wheeler is manually operated. In order to park two wheeler on centre stand we have two pull back the two wheeler which requires more man power. So, in order to minimize human effort we are converting manually operated centre stand into automated centre stand system. To make automated centre stand we are using mechanical system which is driven by power source like battery. The power screw is economic and simple in construction than other possible systems proved by analysis of CAD model of power screw and gear arrangement. In addition, a backup mechanism is provided which can be used even when the battery is discharged. Further the expected design of system will help to lift vehicle by using one power screw mounted on centre of the stand of vehicle up to preset height and parks it on the stand automatically.*

Keywords-Automatic centre stand, Power screw, Two Wheeler main stand.

I. INTRODUCTION

At present we are using manually operated centre stand for two wheelers. This type of manually operated centre stand uses human efforts or work for operations. In order to park two wheeler on centre stand we have two pull back the two wheeler. This requires physical strength and it is difficult to park in narrow area. It is not convenient to park modern bikes for women and aged persons. So in order to overcome this problem we are making automatic system for centre stand of two wheeler which is easy to operate and requires no man power^[1]

The system we are using consist of a power screw. Power screw is a drive used in machinery to convert rotary motion into linear motion for power transmission. The power screw is designed as either the screw is held at rest and other member rotates. Power screw normally uses square threads. Power screw should be designed for smooth and noiseless transmission of power with ability to carry heavy loads with high efficiency. Power screw is use to raise or lower a large load by applying a small force in horizontal direction. Use of

power screw in the system eliminates requirement of separate self locking mechanism.

The operation of the automatic centre stand system is controlled through a two way centre switch which is operated by key. Operation of this system requires very less power. This power is supplied by battery of vehicle. In case of failure of battery or supply cables, a backup supply in the form of extra battery is provided.^[2]

II. LITERATURE REVIEW

Shrivastav et al. investigated about possible systems for making automatic side stand of two wheeler they give detailed description of the system to make opening and closing of side stand automatically^[1].

Everest et al. studied about the causes of road accidents of motorcycles. Out of which they have given one of the reason for accident is improper lifting of side stand^[2].

Paolo Gallina studied that vibrations can occur in screw jack mechanisms under certain conditions, especially during downward motion. It gives a simple but effective way to avoid instability in screw jack mechanisms: in order to prevent the mechanism from vibrating (instability), it is sufficient to clamp (when allowed) an inertia mass to the free end of the screw^[3].

Pandey investigated about the energy efficient power screw. They have studied about increase in the efficiency of motorized screw jack by varying helix angle by which energy drawn by motor can be decrease^[4].

B. Fakih, M. Dienwiebel The aim of this study is to understand the tribological mechanisms that lead to the failure of the commutating system of a DC motor. Brush and commutator are the most stressed components of a DC motor because of their role in transferring the current from the power unit to the rotor. Interrupting one of these parts leads to an unusual current transition and mostly to a complete damage of the motor. Two DC motors were analyzed after continuously running in a laboratory environment under the same

conditions. Failure of one of the motors was observed after 1200 h, while the other one completed the test (1500 h) without any interruption^[5].

III. COMPONENTS OF THE SYSTEM

1. DC motor
2. Power screw
3. Two-way Switch
4. Dry Cell Battery
5. Power transmitting components

DC MOTOR

DC motor is a device that converts electrical power into mechanical work. A DC motor's speed can be controlled over a wide range by changing supply voltage. The brushed DC motor generates torque from DC power. Due to their advantages like low cost, high reliability and simple control of motor speed, they are widely used^[5].

POWER SCREW

Power screw is a mechanical drive used to convert rotary motion into linear motion for power transmission. Power screw normally uses square threads for low load applications and acme threads for heavy load application. High speed reduction is possible from power screw as well as self locking is possible^[3].

TWO-WAY SWITCH

Two way switching consist of two switches in one location to control up and down movement of power screw.^[3]

DRY CELL BATTERY

Dry cell battery uses electrolyte in the form of paste having enough moisture to allow current flow. It can operate in any orientation without spilling. As it contains no free liquid, making it suitable for portable equipment.^[1]

POWER TRANSMISSION

Power is transmitted from driving component to the driven component through various ways. In this system we are using spur gear drive due to their low cost, and low operating load.^[1]

IV. DETAILED DESCRIPTION OF THE SYSTEM

The system we are making consist of a battery, two way switch, power screw, 12V DC motor and a pair of spur gears to transmit rotational motion to the power screw. The 12 V DC motor is welded on the right side of the bike. This DC motor is supplied with DC current from dry cell battery of bike. In case of failure of battery, a buck-up power supply is provided in the system. As CG of a bike is at the front of its geometric centre so this stand will be installed on the rear of the bike. Due to this, the power screw is fitted below the seat of bike and above the chassis of bike. The power screw we are using have nut rotating at fixed position and screw moving linearly up and down. A pair of spur gears are used to transmit power from DC motor to the nut of power screw. One spur gear is mounted on a DC motor shaft and another spur gear is mounted on the power screw.

When we want to park bike on centre stand, the switch is operated which completes the circuit resulting in flow of current from battery to the DC motor. The DC motor converts this DC current into rotational motion. The power from DC motor is transmitted to the power screw through spur gears. Completion of operation of the centre stand is indicated by light indicator provided on the display of bike. Reversal of operation of the system is possible by changing the direction of rotation of the motor. This can be done by changing the direction of current by switching key in opposite direction.

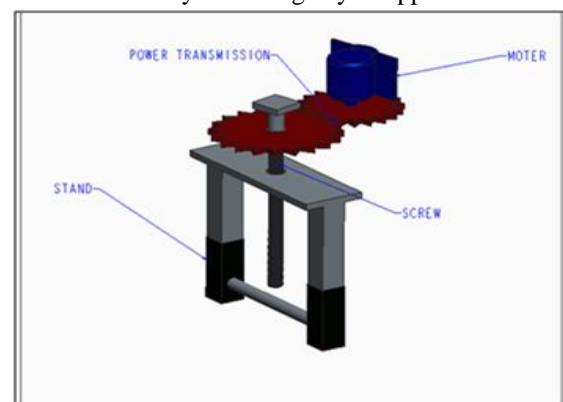


Fig. 1. CAD model of mechanism for automatic centre stand

IV. RESULT

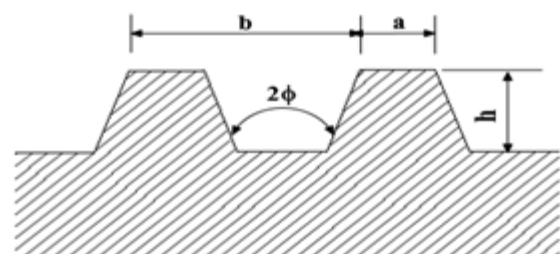


Fig. 2. ACME tooth geometry [5]

Specification of Screw:

Thread type = Acme Threads

Load to be lifted:

$F = 2500 \text{ N}$ Weight of bike (max.) = 250 kg

Torque required to lift the bike:

$T_{up} = 11.74 \text{ Nm}$

RPM of gear mounted on screw:

120 RPM

Force on gear:

469.6 kN

Power required: 4 kW

Gear ratio: 100

Balancing & position of stand: As CG of a bike is at the front of its geometric centre so this stand will be installed on the rear of the bike.

V. CONCLUSION

In this paper, the characteristics of different types of system that can be used for making automatic centre stand are analyzed and their possible advantages and disadvantages taken into consideration. Thus, referring to above systems, power screw system is chosen due to its advantages like low installation cost, less maintenance, simple design. By implementing this system the operation of the centre stand is automated.

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